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The moderating effect of firm age on capital structure choices: evidence from emerging markets

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Abstract
This research analyses how a firm's age moderates the link between emerging market firm characteristics such as their profitability, firm size, asset tangibility, and their financing decisions (i.e., the level of leverage undertaken by these firms). Our empirical analysis reveals more evidence that firm age, as a firm-specific factor, not only amplifies the negative influence of profitability on leverage but also reinforces the adverse relationship between firm size and leverage. In addition, we also found that firm age weakens the positive relationship between asset tangibility and leverage. This research contributes to the corporate finance, corporate governance and emerging market finance literature by analysing how firm age influences the effects of emerging market firm characteristics. Additionally, this study contributes to the growing literature on the determinants of the gearing of firms, particularly on the role of firm-specific factors in explaining the variation in firms' leverage.

Keywords Firm age · Emerging markets · Firm characteristics

JEL Classification G30

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1 Introduction

Corporate finance research suggests that as business corporations grow older, their corporate behaviour changes. These changes can involve their financing decisions. Several studies provide evidence for this view (e.g., Diamond, 1989; Khémiri & Noubbigh, 2018; Kieschnick & Moussawi, 2018; Nguyen et al., 2020; etc.). These changes can be explained by the trade-off theory. According to the trade-off theory of capital structure, firms strive to balance the costs and benefits of debt and equity to minimise their overall capital costs (Ai et al., 2021). As firms age, it can be argued that they may use less debt in their capital structure. Older and more mature firms typically have accumulated profits, developed steady revenue streams and a more predictable business model, which means they might have less reliance on debt for their financing needs. Over time, older and more mature firms are more likely to have established a substantial equity base, which reduces the necessity of leveraging with debt. Furthermore, older firms might be more cautious about taking on additional debt because of the potential financial distress costs associated with higher levels of borrowing (Adair & Adaskou, 2015; Myers, 1984a, 1984b). Additionally, the conservatism that often comes with age and an intent to sustain their market position might push them to adopt less risky financial strategies. More conservative financial strategies can include reducing the proportion of debt in their capital structure to prevent any potential financial distress or bankruptcy risks associated with higher levels of debt (Kieschnick & Moussawi, 2018). Therefore, as informed by the trade-off theory, one would argue that as firms age, they are inclined to use less debt to maintain financial stability and to leverage their accumulated equity more efficiently. The trade-off theory is also relevant to Islamic firms. Narayan et al. (2021) investigated the relevance of trade-off theory in the context of Islamic stocks. They found that Islamic stocks possess higher leverage speed of adjustment (SOA) which is consistent with the trade-off theory. They concluded that the trade-off theory plays a significant role in the capital structure decision-making of Islamic financial markets.

Furthermore, there are some interesting research findings in the literature with respect to emerging market firms. For example, firms in China tend to invest more in input innovation during the introduction, growth and decline phase of their firm life-cycles when they have higher asset liquidity, but they invest less during the maturity stage under the same financial conditions (Shahzad et al., 2022). This implies that the leverage decisions of firms in China could possibly be different as they age (i.e. move from one phase of life-cycle to another) when the assets of their firms are more liquid. In addition, firms in emerging markets also tend to grow more slowly as they age compared to those in developed economies (Hsieh & Klenow, 2014) which suggest that their level of financing could also possibly be lower as compared to firms in developed countries. Considering these examples, it would be interesting to conduct further research on emerging market finance as there is still a lot we do not know with respect to this area of knowledge.

Currently, there is insufficient evidence on how firm age moderates the relationship between firm characteristics such as profitability, firm size and asset

tangibility with leverage for firms in emerging markets. Most studies focus upon one aspect of analysis such as firm size or asset tangibility but do not provide a comprehensive insight into firm age as a moderating factor. Importantly, studies do not focus specifically on the influence of firm age for firms in emerging markets. To the best of our knowledge, we are the first to study how firm age moderates the relationship between emerging market firm characteristics such as profitability, firm size, and asset tangibility and their financing decisions. The study uses a comprehensive and well-diversified dataset of emerging market firms as well as the Blundell and Bond generalised method of moments (GMM), one-step and two-step estimation techniques. Our research contributes to the corporate finance, corporate governance, and emerging market finance literature by analysing how firm age plays a moderating role in influencing the financing decisions of emerging market firms given the fact that these firms may possess different behaviour and characteristics compared to those in developed economies as they age. Secondly, we contribute to the growing literature on the determinants of the gearing of firms, particularly on the role of firm-specific factors in explaining the variation in firms' leverage (Khémiri & Noubbigh, 2018; Nguyen et al., 2021). We empirically found that firm-age (i.e., firm-specific factor) helps to strengthen the decreasing impact of profitability on leverage as well as strengthen the decreasing influence of firm size on leverage. In addition, we also found that firm-age weakens the increasing impact of tangibility on leverage. Moreover, profitability and firm size have a direct negative impact on leverage while tangibility has a direct positive impact on leverage.

As control variables, other firm-specific factors such as dividend pay-out ratio (negative sign), market-to-book ratio (positive sign), and depreciation to total assets (negative sign) demonstrate consistent impact on the firm's leverage ratio in all the models. Also, as control variables, macroeconomic factors such as market capitalization to GDP ratio (negative sign), interest rate (negative sign), and private credit to deposit money bank ratio (negative sign) consistently impact the firm's leverage ratio. Additionally, the lagged dependent variable is statistically significant in all the models which suggest that if firms deviate from their target leverage, they adjust the target leverage which is consistent with the dynamic trade-off theory. There are also useful policy implications of our research for policymakers in emerging markets whereby they can generate policies to manage the debt levels of their public-listed firms more efficiently, so that potential underinvestment problems in their economies can be reduced.

We organise our paper as follows. The second section discusses the literature and hypotheses for empirical testing. The third section discusses the sample development, data, and definitions of variables. The fourth section discusses the research model and estimation technique. The fifth section discusses the research results and robustness tests. The sixth section discusses the implications of the research findings, and the seventh section concludes.

2 Literature and hypotheses for empirical testing

2.1 Leverage in developing countries

Corporate leverage particularly in developing countries has increased drastically over the past decade. The leverage of non-financial developing country firms has increased from USD 5 trillion in 2006 to more than USD 25 trillion in 2018. In addition, the leverage-to-GDP ratio in developing countries' firms has also increased drastically over the past decade (Alter & Elekdag, 2020). This increase can be attributed to several factors unique to these markets, such as for example, poorly-developed and inefficient financial markets (Demirgüç-Kunt et al., 2020; Ramaian Vasantha et al., 2023) and the limited accessibility of private equity (Sachs et al., 2019). Hence, banks play a central role in firm financing in these countries (ElBannan, 2017). Furthermore, considerable differences in the level of information available to stakeholders, excessive family ownership (Liew & Devi, 2021, 2022; Liew et al., 2015, 2017, 2021, 2022), high gearing, poor legal systems as well as social instability also exist in these countries (Ahunwan, 2002; Rwegasira, 2000). In comparison to developed countries, developing nations experience a lower level of liquidity in their financial markets, contributing to heightened volatility (ElBannan, 2017). Unlike their developed counterparts, credit markets in advanced economies benefit from ample information, enabling banks to selectively engage with firms demonstrating a high probability of debt repayment (Shahbaz et al., 2021). Conversely, developing countries face challenges in accessing capital, possess underdeveloped financial markets, and receive inadequate investment from institutional sources (ElBannan, 2017; Ramaian Vasantha et al., 2023). These distinctive attributes of developing nations may shape their financing preferences, setting them apart from those observed in advanced economies (ElBannan, 2017).

The trade-off theory suggests that firms aim to find an optimal capital structure that balances the tax advantages of debt with the costs of financial distress. In developing countries, firms may seek to strike this balance to maximise their value and minimise their cost of capital. This could lead to a moderate level of leverage, where they use a combination of debt and equity financing to fund their operations and growth (Matemilola et al., 2017; Thi Viet Nguyen et al., 2021). Furthermore, in emerging markets such as China, firm age can possibly influence capital structure decisions. Shahzad et al. (2022) found that firms in China invest more in input innovation during the introduction, growth and decline phase of their firm life-cycles when they have higher asset liquidity. However, they invest less during the maturity stage under the same financial conditions. This implies that the leverage decisions of firms in China could possibly be different as they age (i.e. move from one phase of life-cycle to another) when the assets of their firms are more liquid. Since firm age can possibly predict the capital structure decision of firms in emerging markets, we investigate the moderating role of firm age on the relationship between profitability and leverage, between firm size and leverage as well as between asset tangibility and leverage in these firms.

2.2 The moderating effect of firm age on the relationship between profitability and leverage

The interplay between profitability and a firm's capital structure is a well-explored theme in the literature. The Pecking Order Theory asserts that highly profitable firms tend to favor internal financing over external sources, resulting in an inverse relationship between profitability and leverage. Numerous studies validate this negative correlation (Booth et al., 2001; Kumar et al., 2017; Nguyen et al., 2020). However, there exist contrasting findings, with some studies suggesting a positive connection between firm profitability and leverage (Fourati, 2021; Jermias & Yigit, 2019). Furthermore, other studies propose that profitability exerts no significant influence on a firm's leverage (Mohammad et al., 2022).

Offering valuable insights into the dynamics of debt and profitability, the trade-off theory provides a framework for assessing the impact of a firm's age on this relationship. According to this theory, firms strive to strike a balance between the benefits and costs of debt financing to optimize their overall value (Coad et al., 2013; Diamond, 1989; Frank & Goyal, 2008; Kim, 1978; Margaritis & Psillaki, 2010; Pervan et al., 2019; Samosir, 2018). Considering the moderating role of firm age, several factors come into play. Older and more mature firms may have established more stable cash flows and accumulated assets, providing them with collateral that can be used to secure debt (Cao & Whyte, 2023; Frank & Goyal, 2003; Myers, 1984a, 1984b).

Drawing upon the Pecking Order Theory (Myers & Majluf, 1984), this can result in older firms resorting to internal financing (i.e. tapping into their retained earnings since they have more stable cash flow) rather than resorting to external financing such as debt. Second, older firms may utilise less leverage and more equity financing to avoid the potential risks and costs associated with higher levels of debt, which can include financial distress and bankruptcy costs. Hence, as firms age, profitability results in further reduction in leverage. In addition, there is another angle to explain this. From the corporate governance perspective, older firms have more established corporate governance structure that emphasises financial prudence and risk management which results in lower level of corporate leverage (Kieschnick & Moussawi, 2018). Third, more established and older firms might have better access to equity markets, which can provide a significant source of capital without increasing the firm's leverage, thereby exhibiting a negative relationship between profitability and leverage as the firm ages. In conclusion, drawing on the trade-off theory, we posit that firm age may exert a negative moderating influence on the association between profitability and leverage. This contention stems from several factors, encompassing a conservative inclination toward debt financing, the presence of well-established corporate governance structures, and enhanced access to equity markets. These elements collectively contribute to the nuanced dynamics observed in the relationship between profitability and leverage, with firm age acting as a key moderating variable. Hence, the following hypothesis is developed:

H_1 There is a negative moderating effect of firm age on the relationship between profitability and firm leverage.

2.3 The moderating effect of firm age on the relationship between firm size and leverage

The size of firms has a significant influence on firms' financial decisions as well as their financial performance. Larger firms often have greater access to external financing due to their size and stability. According to the trade-off theory, larger firms may be more inclined to take on debt because they can better absorb the financial distress costs and benefit from the tax advantages of debt. This suggests a positive relationship between firm size and leverage. Moradi and Paulet (2019) found that firm size is significantly positively correlated with leverage along with its debt-to-equity ratio whereas Muthusamy and Kannan (2023) found that there is no relationship between firm size and its financial performance. Furthermore, Rajan and Zingales (1995) argue that larger firms encounter less insolvency costs and possess higher diversified portfolios (with a lower likelihood of becoming insolvent). This was evident during the Covid-19 pandemic when many smaller size firms with weak financial support as well as weak financial performance became insolvent (Dörr et al., 2022). Generally, all previous research documented a positive link between the size of firms and their gearing (e.g., Booth et al., 2001; Byoun, 2008) except for studies analysing the Asia–Pacific region (Kumar et al., 2017). One possible explanation is that Asian capital markets are not as developed as those in developed countries. Hence, equity issuance by firms in this region is more expensive than debt and only large and wealthier firms could afford to issue equity (Kumar et al., 2017). Therefore, larger firms in this region are more inclined to raise capital via equity and incur less debt as their capacity to issue equity is higher compared to smaller firms. This is consistent with the finding by Nunkoo and Boateng (2010) who found that firm size is inversely related to leverage and also consistent with the findings of Mohammad et al. (2022) who found that larger firms rely on fewer debts in their financing. Firms in regions other than the Asia–Pacific have positive relationships between the size of their firms and gearing because larger firms in these regions can undertake debt at lower costs compared to smaller firms (Nguyen et al., 2020). Since debt cost is cheaper than equity cost for larger firms in these regions, the latter tends to incur more debt rather than equity.

From the age perspective, we argue that the age of a firm can negatively moderate the relationship between firm size and its leverage for several reasons. First, older firms might have reached a maturity stage where they have stable operations and cash flows. As a result, they may rely less on external financing and more on internal funds, thereby reducing their leverage ratio (Kieschnick & Moussawi, 2018). Their stable finances enable them to depend more on internal financing rather than external financing, leading them to a lower debt usage. In addition, as a firm ages, its established business model and consistent revenue streams reduce the need for leverage. Second, based upon the Pecking Order Theory (Myers & Majluf, 1984), older firms tend to utilise more internal financing (i.e. tapping into their retained earnings since they have more stable cash flow) rather than resorting to external financing such as debt. Utilising insights from the trade-off theory, we propose that the relationship between profitability and leverage is negatively moderated by firm age. This proposition is grounded in various factors, including a conservative orientation

toward debt financing, the existence of well-established corporate governance structures, and improved access to equity markets. Together, these elements form a cohesive framework that adds nuance to the dynamics characterising the connection between profitability and leverage, highlighting firm age as a pivotal moderating variable in this interplay. Hence, the following hypotheses is developed:

H_2 There is a negative moderating effect of firm age on the relationship between firm size and firm leverage.

2.4 The moderating effect of firm age on the relationship between asset tangibility and leverage

The structure of assets of a business corporation is defined by its tangibility. Asset tangibility is one of the significant predictors of capital structure. According to the trade-off theory, firms with higher levels of asset tangibility (e.g., physical assets like machinery or real estate) may find it easier to secure debt financing. Tangible assets can serve as collateral, reducing the costs of financial distress and making lenders more willing to extend credit. As a result, there is a positive relationship between asset tangibility and leverage (Booth et al., 2001; Titman & Wessels, 1988). Therefore, asset tangibility should be positively linked to firm leverage (Kumar et al., 2017) and several studies have confirmed that this is the case (Daskalakis & Psillaki, 2008). In addition, according to Trade-Off Theory, companies with higher levels of asset tangibility undertake higher levels of debt (Myers, 1977).The nature of this relationship has been shown to vary between countries. For example, in the Middle East and Pakistan, asset tangibility and debt are inversely related (Kumar et al., 2017) while in Africa, asset tangibility is positively linked to debt levels for large firms but negatively linked to debt levels for small firms (Kumar et al., 2017).

The literature suggests that firm age can also influence the relationship between asset tangibility and debt and firm age can negatively moderate the relationship between asset tangibility and leverage for several reasons. Firstly, older firms may have a higher proportion of depreciated or obsolete assets, which may potentially lessen the borrowing capacity usually granted by tangible assets. Secondly, older firms usually have established reputations and reduced information asymmetry, allowing them to access equity markets more easily compared to newer firms, thus reducing their dependency on debt financing (Camisón et al., 2022). There is a negative correlation between firm age and information asymmetry (Chemmanur et al., 2023) because older firms may have established more robust channels for information dissemination, which may decrease the level of information asymmetry as they age (Bhama et al., 2018). In addition, irrespective of their age, firms might employ strategic management approaches to handle information dissemination, thereby influencing the level of information asymmetry in a way that is not directly caused by the firm's age (Agyei et al., 2020).

Older firms may also demonstrate organisational inertia, where they might be less flexible in changing their capital structures, possibly following more conservative debt policies with reduced debt usage (Haron et al., 2021). Furthermore, older firms

tend to be more mature and stable. This can mean they have already maximised the tax shield benefits of debt and thus have less incentive to use additional tangible assets as collateral for more debt (Melgarejo & Stephen, 2020). In addition, as firms age, they have a longer credit history. Lenders can evaluate the creditworthiness of older firms more accurately. With this information, the need for tangible assets as collateral (and hence the positive relationship between asset tangibility and leverage) might diminish (Melgarejo Duran & Stephen, 2020). Moreover, older firms might want to maintain a certain reputation in the market. High leverage can sometimes be perceived as risky or aggressive by investors, stakeholders or market analysts (Santos et al., 2014). Based upon all these arguments, we develop the following hypothesis:

H_3: There is a negative moderating effect of firm age on the relationship between asset tangibility and firm leverage.

3 Data, sample, and variable justification

This study obtained secondary datasets of developing countries from DataStream database. The selected developing countries are Brazil, Chile, Mexico, Peru, South Africa, Egypt, Ghana, Jordan, Nigeria, Kenya, Mauritius, Tunisia, India, Indonesia, Bangladesh, Malaysia, Pakistan, Philippines, Sri Lanka, Thailand, Poland, and Turkey (see Table 1 for the number of firms in each country). Like past studies on capital structure, we used both firm-level and country-level data. The selection sample considered firms that are listed on the stock exchange due to better accuracy in the reporting of financial data. Moreover, the twenty-three developing countries selected have a functioning financial market where the prices of their financial assets are in equilibrium.

Following some previous studies (Matemilola et al., 2019), the study excluded utility firms and financial firms because they are regulated, and their gearing is higher than non-regulated firms. Industry factor is important when analyzing financial structure. The research inquiry controlled for industry fixed effect via the usage of a dummy variable technique. The industries included in the study are manufacturing, construction, transportation, communication, and services. The sample periods focused on the period from 2010 to 2018 for two major reasons. Firstly, the study sample period starts from 2010 so as to avoid the impact of the 2008 financial crisis in the United States which impacted developing countries severely in 2009. Secondly, the sample period ends in 2018 to avoid the impact of the Covid-19 pandemic which started in the last quarter of 2019. The study does not intend to focus on the impact of the 2008 financial crisis and the impact of the Covid-19 pandemic on leverage. The final sample collected was made up of 4866 firms from 23 developing countries. The data is balanced panel as the time periods are the same for all firms in the sample. The country-specific data are sourced from the World-Bank database and the World Economic Outlook data of the IMF. The total debt to total assets (FL) ratio is used as the dependent variable because total debt is a larger measure of firms' total indebtedness and managers make their capital structure decisions based

Table 1 Sample distribution

Number of firms	Cumulative number of firms	Average leverage by country	Number of firms
Bangladesh	46	46	22.70
Brazil	170	216	32.23
Chile	123	339	24.67
Egypt	86	425	18.55
Ghana	7	432	26.53
India	1991	2423	28.97
Indonesia	311	2734	26.64
Jordan	69	2803	20.23
Kenya	23	2826	21.01
Morocco	22	2848	20.64
Mauritius	18	2866	24.52
Malaysia	631	3497	18.15
Mexico	87	3584	20.04
Nigeria	41	3625	19.38
Poland	298	3923	18.84
Philippines	81	4004	23.44
Peru	47	4051	22.63
Pakistan	79	4130	28.97
South Africa	175	4305	18.02
Srilanka	147	4452	20.52
Turkey	222	4674	25.27
Thailand	206	4880	23.31
Tunisia	6	4886	23.94

on book value (Khémiri & Noubbigh, 2018; Matemilola et al., 2012). In accordance with past studies, we use book value-based measures, total debt to total assets ratio, as the measure of leverage in this study. Firm age is used as a moderating variable because the impact of profits, firm size, and tangibility on leverage may be conditional on firm age. As firms age they have more assets-in-place (Matemilola et al., 2017; Sundaresan et al., 2014) which justify taking on more debt. Conversely, as firms age they may value financial flexibility (DeAngelo & Roll, 2015) which justify taking on less debt.

Firm size (LTA) is a predictor of leverage because larger firms are more resilient. Findings on the link between firm size and leverage are mixed. However, the majority of the past studies (e.g., Bilgin & Dinc, 2019; Frank & Goyal, 2003) report a positive influence of the size of firms on leverage. Tangibility (TANG) is a determinant of leverage as firms can use fixed assets as security to obtain debt capital. Most of the past studies (e.g., Daskalakis & Psillaki, 2008; Frank & Goyal, 2009; Khémiri & Noubbigh, 2018; Matemilola et al., 2019) also document positive impact of tangibility on leverage. Profits (PROF) is another determinant of leverage because profitable firms have less need to use debt capital. The empirical evidence is mixed but majority of the past

studies (e.g., Alves & Ferreira, 2011; Frank & Goyal, 2003) report negative impact of profits on leverage.

The firm-level control variables in this study are market-to-book ratio, depreciation, and dividend pay-out ratio as in Frank and Goyal (2009) and Matemilola et al. (2019). As a control variable and from the perspective of the trade-off theory, firms with high market-to-book ratio use less debt because it represents growth opportunity and intangible assets which has no collateral value in the event of bankruptcy (Myers, 1984a, 1984b). Based on the trade-off theory, firms with high-market-to-book ratio should accrue less debt because it is an intangible asset without collateral value. Depreciation acts as substitutes for tax shields and should reduce debt usage (Jaworski & Santos, 2021). Hence, depreciation should reduce debt because the alternative tax-shield source reduces debt attractiveness. Firms that pay dividend use less debt (Bilgin & Dinc, 2019; Frank & Goyal, 2009). Conversely, firms that pay more dividends increase debt usage suggesting that management increases dividend to use up excess debt capacity (Frank & Goyal, 2009).

The macro-level control variables are interest rates, GDP growth rate, stock market development, banking sector development, and the legal system. The interest rate is a bank's lending rate. A higher interest rate increases the costs of debt and restricts a firm's use of high leverage (Khémiri & Noubbigh, 2018; Matemilola et al., 2019). GDP growth rate affects leverage because it is correlated with firms' growth (Çam & Ozer, 2022; Khémiri & Noubbigh, 2018). As increase in economic growth rates signal good economic prospects, and therefore firms are encouraged to use high leverage. As the stock markets develop, transaction costs reduce which encourages firms to raise capital from the stock markets, thereby lowering leverage ratios (Fan et al., 2012; Matemilola et al., 2019). Conversely, as the banking sector develops, costs of borrowing reduce which encourages firms to raise capital through the banks, thereby increasing leverage ratios (Booth et al., 2001). The nature of the legal system also affects leverage. Fan et al. (2012) note that a country's legal system explains substantial variation in the leverage ratio. A strong legal system encourages lenders to lend money because of the assurance that the judicial system will ensure borrowers' compliance to the contractual agreement should a problem arise (Fan et al., 2012; La Porta et al., 1997).

Table 2 below describes the measurement of the variables and mean and standard deviation (SD) of the variables where private credit by deposit money bank to GDP ratio (PCDM) has the highest mean, and depreciation to total assets ratio (DEPTA) has the lowest standard deviation indicating the least volatile variable.

Measurement of variables and descriptive statistics

4 Research model and estimation strategy

$$\begin{aligned} FL_{ij,t} = {} & \lambda FL_{ij,t-1} + \beta_0 + \beta_1 EBITA_{ij,t} + \beta_2 SIZE_{ij,t} + \beta_3 TANG_{ij,t} + \beta_4 FAGE_{ij,t} \\ & + \beta_5 (PROF * FAGE)_{ij,t} + \beta_6 (SIZE * FAGE)_{ij,t} + \beta_7 (TANG * FAGE)_{ij,t} \\ & + \beta_8 Firm\_Control_{ij,t} + \beta_9 Macro\_Control_{j,t} + \delta_i + \alpha_t + \mu_{it.} \end{aligned}$$

where: ij,t = the firm, country, and year, respectively, $FL_{ij,t}$ = Book value of total debt to total assets ratio, $FL_{ij,t-1}$ = Book value of total debt to total assets ratio in

Table 2 Descriptive statistics and definition of variables

Variable	Definition	Mean	SD	Min	Max
FL	Book value of total debt to total assets ratio	0.250	0.201	0.000	1.000
SIZE	Log of total assets (total assets is measured in USD)	56,800	53,200	692	29,107,171
MTB	Book value of debt plus market value of equity divided by book value of total assets	1.898	2.171	3.801	42.010
TANG	Property, plant and equipment, net to total assets ratio	0.362	0.230	0.001	1.800
DEPTA	Depreciation to total assets ratio	0.030	0.028	0.002	5.492
PROF	Earnings before interest and tax to total assets ratio	0.094	0.085	0.052	1.962
FAGE	Year since the time the firm is established	33.046	19.828	0.000	88.000
POR	Dividend Pay-out ratio (%)	18.520	25.606	0.000	100.000
MCGDP	Market capitalization to GDP ratio (%)	74.782	48.366	7.830	280.000
SP	Stock Prices	1.29	2.90	0.09	15.04
GPDG	Growth rate of GDP (%)	5.573	2.369	4.830	14.050
INTE	Bank lending rates (%)	10.040	6.736	1.309	40.350
PCDBM	Private-credit provided by deposit money-bank to GDP ratio (%)	57.790	27.614	0.000	124.000
LS	Legal system dummy (one for common laws and 0 for civil laws)	0.687	0.463	0.000	1.000

previous year, $SP_{ij,t}$ = Return on Stock prices, $FAGE_{ij,t}$ = Years since the time the firm is established, $PROF*FAGE_{ij,t}$ = interaction of profitability and firm age, $SIZE*FAGE_{ij,t}$ = interaction of size and firm age, $TANG*FAGE_{ij,t}$ = interaction of tangible assets and firm age, λ = Adjustment to previous year FL, δ_i = firm-specific effects, α_t = Year fixed effects, μ_{it} = Error term.

All other variables in the model are as defined in Table 2.

The above model is dynamic because of the addition of lagged dependent variable ($FL_{ij,t-1}$) as previous year leverage can affect the current leverage (Matemilola et al., 2019). To estimate this dynamic model, we applied the two-step system generalized method of moments as the main estimation strategy. The reason is that the two-step system generalized method of moments is the most efficient method to estimate a dynamic model which possesses endogeneity problems (Blundell & Bond, 1998), as it can produce unbiased estimators. Although, the two-step system GMM is powerful or superior to the one step system GMM when estimating the parameters of a dynamic panel model, the one step system GMM is applied as a robustness test because it is also used in the literature to estimate a dynamic panel model for a results comparison. Additionally, the focus of this paper is to model a dynamic relationship among the variables. Thus, an estimation method that is relevant for estimating a dynamic panel model (i.e., one-step system GMM) is appropriate for a comparative purpose.

To overcome the problem of endogeneity, researchers mostly rely on the instrumental variable technique. The researchers search for an instrument that is correlated with the independent variable of interest but uncorrelated with the error-term. However, it may be difficult to get good external instruments and the use of bad

instruments would cause more problems (Jiang, 2017). Moreover, the use of the two-step system generalized method of moments reduces the endogeneity problem using the lag levels and lag differences of both the independent variables and the dependent variables as internal instruments (Blundell & Bond, 1998). The main estimation uses two-step estimates because this method uses the first-step errors to construct heteroskedasticity-consistent standard errors (Blundell & Bond, 1998). The two-step system generalized method of moments use both the difference generalized method of moments' conditions and additional moment condition to produce unbiased estimators.

5 Discussion of research results

Table 3 reports the correlation results. The independent variables possess lower correlation which suggests there is little risk of a multicollinearity problem in the dataset. The first highest correlation (0.43) is between tangibility (TANG) and depreciation to total assets ratio (DEPTA). The second highest correlation (0.39) is between market capitalization (MCGDP) and GDP growth rate. The third highest correlation (0.32) is between profitability (PROF) and market-to-book ratio (MTB). The rest of the correlation coefficients are lower than the three highest correlation coefficients described above.

Table 4 reports the main results of the two-step system generalized method of moment while Table 5 reports the robustness test results of the one-step system generalized method of moment. The results of both estimation methods are broadly similar. First, as firm age negatively moderates the relationship between profitability and leverage, our alternative hypothesis 1 is supported. This result means that for a unit increase in firm age, the effect of profitability changes by – 0.022, – 0.015, – 0.024, and – 0.013 in models 3, 6, 7, and 8, respectively. These changes are small suggesting that the moderating impact of firm age on the link between leverage and profitability appears negligible. The negative moderating effect of firm age on the relationship between profitability and leverage suggests that profitable firms are less likely to rely on external financing (perhaps because they arrange internal financing through retained earnings) and the negative relationship between profitability and leverage further strengthens as firms become mature. Based upon this finding, we argue that as a firm matures over time and gains more experience, each unit increase in profitability results in an even greater reduction in reliance on external financing, as compared with when the firm was younger. This can be explained by the trade-off theory of capital structure whereby firms balance the benefits and costs of debt and equity to maximise their value. As firms mature, they tend to have more stable cash flows, which facilitates a reduction in their reliance on external financing. With increased profitability, mature and older firms can reinvest profits back into the business, reducing the necessity for external debt, which comes with interest costs and potential financial distress. Moreover, mature and older firms may have established a good credit reputation, allowing them to secure favourable terms if they choose to utilise debt financing (Adair & Adaskou, 2015; Agyei et al., 2020; Frank & Goyal, 2008).

Table 3 Correlation matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13
FL (1)	1.00												
SIZE (2)	0.17***	1.00											
MTB (3)	– 0.04*	0.13***	1.00										
TANG (4)	0.21***	0.09**	– 0.04*	1.00									
DEPTA (5)	0.09**	0.08**	0.07**	0.43***	1.00								
PROF (6)	– 0.20***	0.12**	0.32***	– 0.08**	0.04*	1.00							
POR (7)	– 0.20***	0.15***	0.15***	0.01	0.03*	0.23***	1.00						
FAGE (8)	– 0.03*	0.15***	0.03*	0.03*	0.01	0.02*	0.11**	1.00					
SP (9)	– 0.07***	0.01**	0.31***	0.01	0.05***	0.15***	0.07***	– 0.02**	1.00				
GDPG (10)	0.07**	0.01	0.05**	– 0.01	– 0.03*	0.03*	– 0.16***	– 0.05**	0.04***	1.00			
INT (11)	0.10**	0.07**	0.03*	– 0.01	– 0.02*	0.03*	– 0.02*	0.11**	– 0.23***	0.01**	1.00		
PCDBM (12)	– 0.11**	– 0.31***	– 0.08**	– 0.08**	– 0.03*	– 0.09**	0.10**	– 0.05*	– 0.20***	– 0.30***	– 0.06**	1.00	
MCGDP (13)	– 0.02*	– 0.14***	0.09**	– 0.08**	– 0.11**	0.12**	– 0.07**	– 0.05**	0.39***	– 0.28***	0.27***	– 0.03**	1.00

Asterisks *, **, and *** indicate significance at 10%, 5%, and 1%, respectively. Refer to Table 2 for the definition and measurement of variables

Table 4 Two-step System Generalized Method of Moments' Results

	Model 1	Model 2	Model 3
Variables			
L.FL	0.740*** (77.14)	0.735*** (74.99)	0.739*** (78.11)
PROF	– 0.116** (– 2.16)	– 0.143** (– 2.04)	– 1.274** (– 2.92)
SIZE	– 2.841*** (– 7.67)	– 2.647*** (– 6.89)	– 2.822*** (– 6.50)
TANG	8.766*** (5.43)	7.929*** (4.75)	9.631*** (3.54)
FAGE	– 0.123*** (– 6.21)	– 0.119*** (– 5.07	– 0.352*** (– 3.64)
MTB	0.168* (1.95)	0.060** (2.48)	0.274*** (4.79)
DEPTA	– 18.322** (– 2.09)	– 17.755*** (– 2.76)	– 22.765** (– 2.42)
POR	– 0.055*** (– 5.79)	– 0.058*** (– 5.82)	– 0.063*** (– 6.68)
SP	– 0.143*** (– 2.91)	– 0.109** (– 2.18)	– 0.038** (– 2.27)
GDPG	–	– 0.006 (– 0.14)	– 0.008 (– 0.20)
INT	–	– 0.061** (– 2.15)	– 0.048* (– 1.77)
PCDBM	–	– 0.067*** (– 3.40)	– 0.042** (– 2.25)
MCGDP	–	– 0.017*** (– 3.00)	– 0.012*** (– 2.17)
LS		– 2.986*** (– 2.95)	– 2.729*** (– 2.88)
PROF*FAGE	–	–	– 0.022*** (– 3.81)
SIZE*FAGE	–	–	– 0.059*** (– 4.28)
TANG*FAGE	–	–	– 0.109*** (– 2.77)
Constant	– 9.698*** (4.36)	– 4.567** (– 2.66)	– 14.807*** (– 3.59)
Year effects	No	Yes	Yes
Firm-specific effects	No	No	Yes
Country effects	No	Yes	Yes
Observations (N*T)	39,296	39,296	39,296
Number of firms (N)	4866	4866	4866
Number of instruments	148	152	194
2nd order serial correlation (p-value)	0.808	0.826	0.797
Hansen Test (p-value)	0.395	0.460	0.503

Refer to Table 2 for the definition and measurement of variables. Asterisks *, **, and *** indicate significance at 10%, 5%, and 1%, respectively

Numbers in parenthesis are t-statistics. The standard errors of the two-step system GMM are Windmeijer (2005) robust to heteroskedasticity problem

Furthermore, when firms are young, they may rely more on external financing due to insufficient internal funds and possibly volatile earnings. This initial stage often involves higher levels of debt, which may be gradually reduced as the firm grows and stabilises. As the firm becomes more profitable, it can gradually decrease its leverage ratio, making a transition from a high reliance on debt to utilising more equity or retained earnings, therefore maintaining an optimal capital structure that minimises the costs of financial distress and agency costs (Adair & Adaskou, 2015). This analysis is supported by various studies which have analysed firm performance

Table 5 System Generalized Method of Moments' and OLS Cluster at the Firm-level Results (Robustness Test)

	Model 4 One-step	Model 5 One-step	Model 6 One-step	Model 7 Two-step	Model 8 OLS Cluster at the Firm-level
L.FL	0.667*** (93.34)	0.662*** (91.70)	0.661*** (91.69)	0.739*** (77.98)	–
					–
PROF	– 0.107** (– 2.43)	– 0.095** (– 2.38)	– 0.831** (– 2.27)	– 0.406*** (3.28)	– 0.394** (– 2.67)
SIZE	– 2.734*** (– 9.47)	– 2.457*** (– 8.37)	– 3.383*** (– 5.23)	1.924*** (8.76)	2.452*** (10.48)
TANG	9.815*** (7.71)	9.335*** (7.24)	13.983*** (6.14)	7.939*** (2.96)	10.695*** (10.23)
FAGE	– 0.160*** (– 8.43)	– 0.172*** (– 7.33)	– 0.263** (– 2.27)	– 0.069** (2.20)	– 0.095** (– 2.39)
MTB	0.189* (1.90)	0.328*** (3.16)	0.263** (2.66)	0.016** (2.14)	0.122** (2.14)
DEPTA	– 29.468*** (– 3.96)	– 26.209*** (– 3.64)	– 29.079*** (– 4.09)	– 24.548** (– 2.66)	– 2.171** (– 2.36)
POR	– 0.080*** (– 8.46)	– 0.083*** (– 8.79)	– 0.082*** (– 8.74)	– 0.064*** (– 6.73)	– 0.074*** (– 17.17)
SP	– 0.044** (– 2.66)	– 0.030** (– 2.51)	– 0.002** (– 2.03)	– 0.013** (– 2.25)	– 0.135*** – 2.74
GDPG	–	– 0.124** (– 2.43)	– 0.122** (– 2.40)	– 0.017** (– 2.39)	0.020 0.53
INT	–	– 0.086** (– 2.63)	– 0.073** (– 2.24)	– 0.050* (– 1.84)	– 0.167*** (– 6.44)
PCDBM	–	– 0.014** (– 2.66)	– 0.064*** (– 3.24)	– 0.004** (– 2.34)	– 0.025** (– 2.49)
MCGDP	–	– 0.020*** (– 2.82)	– 0.019** (– 2.75)	– 0.010* (– 1.81)	– 0.019*** (– 4.11)
LS	–	– 3.924*** (– 3.52)	– 3.648*** (– 3.40)	– 4.420*** (– 4.97)	– 3.716*** (– 6.62)
PROF*FAGE	–	–	– 0.015** (– 2.61)	– 0.024*** (– 4.16)	– 0.013** (– 2.62)
SIZE*FAGE	–	–	– 0.044** (– 2.61)	– 0.018** (– 2.46)	– 0.007** (– 2.68)
TANG*FAGE	–	–	– 0.165*** (– 3.01)	– 0.057** (– 2.04)	– 0.130** (– 2.52)
Constant term	6.015***	1.103**	8.551*	6.320*	7.445***
	(3.20)	(2.45)	(1.91)	(1.83)	(3.85)
Year effects	No	Yes	Yes	Yes	Yes
Firm specific effects	No	No	Yes	No	No
Industry effects	No	No	No	Yes	Yes
Country effects	No	Yes	Yes	Yes	Yes

Table 5 (continued)

	Model 4 One-step	Model 5 One-step	Model 6 One-step	Model 7 Two-step	Model 8 OLS Cluster at the Firm-level
Observations (N*T)	39,296	39,296	39,296	39,296	39,296
Number of firms (N)	4866	4866	4866	4866	4866
Number of instruments	148	152	194	194	–
2nd order serial correlation (p-value)	0.706	0.638	0.734	0.8031	–
Hansen Test (p-value)	0.425	0.395	0.332	0.419	–
F-Test	–	–	–	–	1076.35

Refer to Table 2 for the definition and measurement of variables. Asterisks *, **, and *** indicate significance at 10%, 5%, and 1%, respectively. Numbers in parenthesis are t-statistics

The standard errors of the two-step system GMM are Windmeijer (2005) robust to heteroskedasticity problem. The ordinary least squares (OLS) results cluster at the firm-level is also robust to heteroskedasticity problem.

and capital structure over time, delineating how mature and older firms can sustain growth while minimising reliance on external financing (Adair & Adaskou, 2015; Agyei et al., 2020).

Second, as firm age negatively moderates the relationship between firm size and leverage, our alternative hypothesis 2 is supported. This result means that for a unit increase in firm age, the effect of size changes by – 0.059, – 0.044, – 0.018, and – 0.007 in models 3, 6, 7, and 8, respectively.These changes are small which suggest that the moderating impact of firm age on the link between leverage and size seems insignificant.The negative moderating effect of firm age on the relationship between size and leverage suggests that as older, larger and more established firms utilise more equity as compared to debt, they have a better capacity to issue equity shares owing to their established reputations, which may foster trust and confidence among investors. This reputational advantage can be further cemented through executive stock purchases, which tend to signal confidence in the company's future prospects (Eccles et al., 2007). Moreover, executives and existing shareholders may be incentivised to buy stocks when prices are increasing, as this can potentially yield substantial profits and further bolster the company's stock prices. Stock prices are influenced by various factors including the performance and reputation of the firm. When a firm has a positive reputation, it often reflects well in its stock prices, which can be a lucrative incentive for stakeholders to invest more in the shares (Egan, 2023). Hence, when firms become older and larger, they utilise less debt.

Third, since firm age negatively moderates the relationship between asset tangibility and leverage, our alternative hypothesis 3 is supported. This result means that for a unit increase in firm age, the effect of tangibility changes by – 0.059, – 0.165, – 0.057, and – 0.130 in models 3, 6, 7, and 8, respectively. These changes are small suggesting that the moderating impact of firm age on the link between leverage and tangibility maybe negligible The negative moderating effect of firm age on the relationship between assets tangibility and leverage suggests that the collateral advantage of fixed assets which make securing debt capital easy, declines as some firms get older due to their depreciation. Depreciation of a firm's collateral can reduce the firm's borrowing capacity in various ways. First, when assets used as collateral depreciate, their value reduces. Lenders typically loan money based on the value of the collateral. If the value drops, the amount lenders are willing to offer may decrease proportionally (Ioannidou et al., 2022). Second, depreciation can amplify issues of asymmetric information in lending markets. As the collateral loses value, lenders might become more uncertain about the borrower's ability to repay the loan, leading to reduced borrowing amounts or higher interest rates (Ioannidou et al., 2022). Third, in scenarios where there are collateral booms, a subsequent depreciation can lead to information depletion. This situation can prevent lenders from providing loans as they have less information about the borrower's creditworthiness (Asriyan et al., 2021).

In all the estimation results, the previous year's leverage affects the current year's leverage which suggest that the model is dynamic, and the system generalized method of moment's is appropriate to estimate the model. These results suggest that if firms deviate from their target leverage level, they adjust the target leverage level;

this finding is consistent with the findings of Matemilola et al. (2019) and Nunkoo and Boateng (2010).

The results show that profitability has a direct negative effect on leverage. Likewise, firm size has a direct negative effect on leverage. Conversely, tangibility has a direct positive effect on leverage. These results contradict the findings of Bauer (2004) except for the relationship between profitability and leverage as in this respect the results are consistent with his findings. Similarly, the positive relationship between asset tangibility and leverage also contradicts the findings by Acedo-Ramirez et al. (2017). considering the control variables, other firm-specific factors such as dividend pay-out ratio has a negative effect on leverage. Similarly, the depreciation to total assets also has a negative effect on the leverage ratio However, the market-to-book ratio has positive effect on leverage ratio. These results are consistent with previous findings of Matemilola et al. (2019), Kumar et al. (2017), and Nunkoo and Boateng (2010).

In terms of other control variables, macroeconomic factors such as market capitalization to GDP ratio is negatively related to leverage ratio. Similarly, the interest rates are negatively related to leverage ratio, and private credit to deposit money bank ratio is also negatively related to leverage ratio. Additionally, the lagged dependent variable is statistically significant in all the models which suggest that if firms deviate from their target leverage, they adjust target leverage (i.e., 1- λ) which is consistent with the dynamic version of the trade-off theory. These results are consistent with the findings of Boateng (2010), Singh and Kumar (2012), Khémiri and Noubbigh (2018) and Matemilola et al. (2019).

Moreover, the post estimation test results reveal that the difference-in-Hansen test is satisfactory as its p-values are statistically insignificant. Also, the second order serial correlation tests are satisfactory as the p-values are statistically insignificant. The two post estimation test results indicate that the models are correctly specified and there are no second order serial correlation problem.

6 Conclusion

Generally, our research significantly contributes to the realms of corporate finance, corporate governance, and emerging market finance literature by delving into the moderating role of firm age in shaping the financing decisions of emerging market firms. It sheds light on the distinctive financing characteristics exhibited by these firms, setting them apart from their counterparts in developed countries. This study marks the pioneering exploration of how firm age moderates the relationships between firm profitability, firm size, and asset tangibility with firm leverage, utilizing a comprehensive and well-diversified dataset of emerging market firms. Notably, our findings reveal that firm age exerts a negative moderating effect on the relationships between firm profitability and leverage, firm size and leverage, as well as asset tangibility and leverage. These insights underscore the significant influence of firm age on the utilization of debt concerning a firm's profitability, size, and asset tangibility in emerging markets.

The study has policy implications for firms, lenders, and policymakers. Firstly, the negative moderating effect of firm age on the relationship between profitability and leverage implies that as firms aged, they possess higher market experience. As older firms become more profitable and retain their profits, they ultimately reduce their dependency on debt financing. Second, the negative moderating effect of firm age on the relationship between firm size and leverage suggests that as firms aged, their size becomes larger due to firm growth and expansion. As firm size becomes larger, emerging market firms reduce their dependency on debt as they can afford to issue equity (Kumar et al., 2017). Third, the negative moderating effect of firm age on the relationship between asset tangibility and leverage implies that the collateral advantage of fixed assets which make securing debt capital easy appears to decline as some firms get older due to the assets depreciating in value which may reduce the firms' borrowing capacity. Fourth, our findings informed lenders of the moderating impact of firm age on some important determinants of firms' leverage and the need to take firm age into consideration when lending debt capital to firms. Fifth, policymakers (e.g., Securities Commission) are informed of the need to manage the level of debts in their public-listed firms as the latter aged and consider firm age factor when formulating policies which can impact firms' financing decisions, in consideration of the fact that the firm's profitability, size and its asset tangibility can influence its financing decisions.

This research possesses certain limitations. Our study is only limited to emerging market firms. Moreover, this study sample focuses on non-crisis years. Future research can compare how firm age moderate the relationships between firm profits, firm size, asset tangibility and retained earnings with firm leverage between emerging markets and developed markets and how the crisis years affect these relationships. Another avenue for future research is to explore the nonlinear relationship between firm profits, firm size, asset tangibility and retained earnings with firm leverage and how firm age moderate this relationship.

On behalf of all authors, the corresponding author states that there is no conflict of interest.

Data availability The datasets analysed in our study are not publicly available but are available from the corresponding author on reasonable request. Interested researchers may contact the corresponding author to gain access to the data under conditions that respect the privacy and confidentiality of the data.

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